

A Work Project, presented as part of the requirements for the Award of a Master Degree in
Economics from the NOVA – School of Business and Economics.

ONE.COST – ASSESSING SOCIAL PROBLEMS COSTS

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6th January 2017

Abstract

This work project is inserted in the larger project “One.Cost”, developed by the *Social Investment Lab*, and intends to be the starting point to identify and assess the cost per unit of social problems. A theoretical background to social problem solving and its challenges is provided as well as an analysis of the application of Cost-Benefit Analysis and Cost-Effectiveness Analysis in measuring social impact. The focus of this paper is on health sector and exposes the main limitations of including costs in social impact measurement, in this particular area.

Key words: Social Problem, Social Entrepreneur, Social Impact Measurement and Health

1. Introduction

Portugal is nowadays exposed to severe social problems in areas as health, education, social protection, employment and professional training. Identifying the more relevant social problems and understanding their root causes and consequences are the starting point to eradicate them and to improve people's lives.

Organizations and individuals are looking for innovative solutions that stimulate the creation of lasting and significant social transformation and social entrepreneurs have become increasingly important in this field. However, creating social impact and, consequently, solving social issues is an arduous and complex process. The challenges begin with the absence of a common definition for key concepts as social impact or social entrepreneur. The lack of standard and user-friendly methods of social impact measurement is another obstacle faced by the social sector. Although it is recognized the value and need for evaluating the performance across social organizations, the resources required and the complexity of the process complicate and dissuade the establishment of a universal measurement tool. In the context of economically evaluating social impact, it can be observed the application of Cost-Benefit Analysis and Cost-Effectiveness Analysis. This economic tools support the decision-making between different social interventions.

This paper is integrated in the One.Cost project, developed by the *Social Investment Lab* that intends to build a database of social problems costs. In section II and III the existing literature on solving social problems and other related concepts, as social entrepreneurs and social impact, is reviewed. Section IV presents the reasons why social impact measurement is needed and the challenges that it faces. In section V, the paper focus on the Cost-Benefit Analysis and Cost-Effectiveness Analysis. Section VI analyses the theoretical framework for assessing social interventions in the health care context. Conclusions and recommendations are presented in section VII.

2. Social Problem and Social Entrepreneur

A **social problem** is a condition affecting negatively and prevalently a group of people (Loseke, 2003) and it is understood and identified by the society as a problem that has to be tackled and subject to public attention (Hilgartner and Bosk, 1988; Loseke, 2011). Poverty, famine, unemployment, environmental pollution and violence are examples of social problems. Those problems imply **social costs** – the opportunity cost of resources allocated to tackle the social problems and the additional costs imposed on society (Deloitte, 2016). In the **social sector**, that comprises “organizations driven primarily by a social purpose” (Ebrahim and Rangan, 2014: 118), foundations, non-profit, charitable organizations and social enterprises try to address social problems, by creating some social change.

There are many different processes to create and enhance social change, but this study will focus on innovation. **Innovation**, in social problem solving, is a completely pioneer and powerful solution that has the potential to continuously increase the change created (Kramer, 2005; Epstein and Yuthas, 2014). In the traditional business context, the agents that, using innovation and going beyond the resources they control, search for change and exploit it as an opportunity are named as “**entrepreneurs**” (Dees, 1998). Adapting this concept to the social sector, it can be concluded that assuming innovation as the solution for social problems implies that the change-makers are in fact **social entrepreneurs** (Dees, 1998). Literature presents different definitions for social entrepreneur and social entrepreneurship (Please see **Table 1**). For the purpose of this study, social entrepreneur is understood as the change-agent (Dees, 1998; Alvord et al. 2004) that contributes to solve social problems through an innovative and sustainable way (Dees, 2012, 1998; Santos, 2012; Austin et al. 2006).

Table 1. Definitions of Social Entrepreneur

Term	Source	Definition
Social Entrepreneur	Dees (1998)	Social entrepreneurs play the role of change agents in the social sector, by: Adopting a mission to create and sustain social value (not just private value) ... without being limited by resources currently in hand (p. 4)
Social Entrepreneur	Alvord et al. (2004)	[C]reates innovative solutions to immediate social problems and mobilizes the ideas, capacities, resources, and social arrangements required for sustainable social transformations. (p. 262)
Social Entrepreneurship	Austin et al.(2006)	[S]ocial entrepreneurship as innovative, social value creating activity that can occur within or across the nonprofit, business, or government sectors. (p. 2)
Social Entrepreneurship	Santos (2012)	Social entrepreneurship is an innovation process in the economy that can happen in different institutional contexts, is based on value creation (p. 350)

By conceiving and investing in innovative and sustainable solutions (Dees, 1998, 2012), social entrepreneurs accomplish their social mission focused on creating a significant and lasting impact (Stevens et al. 2014; Dees, 1998; Santos, 2012). For example, to tackle the social problem of hunger in Portugal, charitable institutions supply meals to poor people. Despite being a noble action, this is not a sustainable solution. In contrast, the social enterprise *Re-Food* developed a sustainable and innovative solution by “rescuing” wasted food and providing it to people who needs. Besides addressing the hunger problem, *Re-Food* also solves the problem of food waste.

3. Social Impact

Any company or organization creates a broad variety of social impacts (Epstein and Yuthas, 2014; Retolaza et al. 2016). In literature there is no standard definition for **social impact** and, in some cases, the term *social value* is used for the same meaning (Maas, 2014) (Please see **Table 2**). In this paper, social impact refers to lasting and significant social change that is caused by an intervention and affects the society.

Table 2. Definitions of Social Impact

Term	Source	Definition
Social Value	Emerson et al. (2000)	Social Value is created when resources, inputs, processes or policies are combined to generate improvements in the lives of individual or society as a whole (p. 137)
Social Impact	Clark et al. (2003)	By impact we mean the portion of the total outcome that happened as a result of the activity of the venture, above and beyond what would have happened anyway (p. 7)
Social Impact	Tuan (2008)	The long-term sustainable and sometimes attributable change due to a specific intervention or set of interventions (p. 30 and 31)
Social Impact	Epstein and Yuthas (2014)	societal and environmental changes - positive and negative, intended and unintended - that result from investments (p.15)

Organizations and individuals' actions seek for creating and maximizing impact – economic or social - in society (Emerson, 2003). The distinction between social and economic goal is a common problem in the social sector field (Emerson, 2003; Santos, 2012). In addition to create an illusory restriction between social and commercial investors (Emerson, 2003), the **dichotomy economic-social** complicates the correct identification of social enterprises as the change-agent that creates social impact (Santos, 2012). The creation of **social impact** is associated with the commitment to others-interest and society rather than self-interest and personal profit (Stevens et al. 2014; Dees, 2012) and is presented as an adverse and independent dimension of economic value (Santos, 2012; Emerson, 2003). The main limitation of the dichotomy social-economic is that the economic value created cannot be separated from social impact (Emerson, 2003; Stevens et al. 2014) because they are two sides of the same reality (Epstein and Yuthas, 2014; Emerson, 2003; Austin et al. 2006). A solution for the problem economic-social is the use of a broader concept of value, “defined in terms of the increase in the utility of society’s members” (Santos, 2012:337), as a “**blended value**” that comprises both social impact and economic value (Emerson, 2003).

Instead of economic-social, it is the dichotomy **value creation and value appropriation** that allows the definition of a social enterprise (Santos, 2012). Value creation is the increase in the

utility and well-being of society as a whole (Kroeger and Weber, 2015; Santos, 2012), while value appropriation is the act of the agent/organization taking some of the value created, for their own interest (Santos, 2012). Although both creation and appropriation can coexist in the same organization (Santos, 2012), the social enterprise is focused on maximizing the value created (Stevens et al. 2014; Santos, 2012) and only uses the value appropriation as a mean to support and improve the value creation operations (Santos, 2012; Dees, 1998). The purpose and strategy driven by a social impact (Dees, 1998) should be explicit in the social enterprise's **mission** (Santos, 2012; Epstein and Yuthas, 2014). The mission statement is the starting point for social entrepreneurship activity and clarifies the actions, the “target population” and the desired outcomes (Epstein and Yuthas, 2014). A strong, explicit and concise mission is crucial to the social entrepreneur's success because it creates discipline, promotes an efficient allocation of resources and prevents degenerative problems inside the organization (Epstein and Yuthas, 2014; Colby et al. 2004).

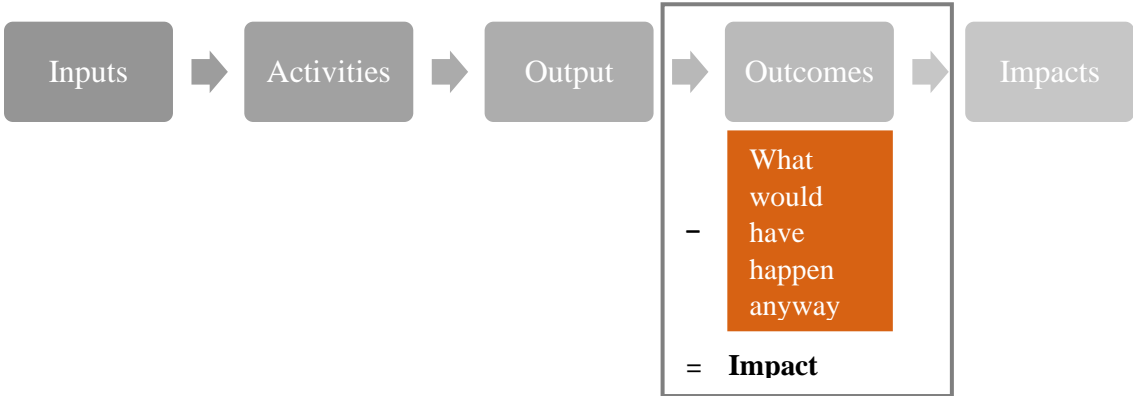
4. Social Impact Measurement

Social impact measurement refers to methods that identify and measure changes in the impact that result from the achievement of the ultimate goal of an intervention, program or policy (Rauscher et al. 2012; Epstein and Yuthas, 2014). As an alternative to impact measurement, some organizations evaluate the success of their activities and projects through **output measurement**, by assessing the outputs supplied (Epstein and Yuthas, 2014; Ebrahim and Rangan, 2014). While **output** is the service or good provided – for example number of free meals served to homeless people – **impact** is the long-term change created by an intervention in society – eradicate hunger and malnutrition (Ebrahim and Rangan, 2014; Rauscher et al. 2012). To understand what should be evaluate – output or impact – in the performance of social sector organizations, literature suggests analysing the **logic model** of social interventions (Ebrahim and Rangan, 2014; Kaplan, 2001). The logic model delineates and describes the

actions and the cause-and-effect logics that transform intended impact into actual change (Colby et al., 2004; Epstein and Yuthas, 2014) (Please see **Figure 1**).

It could be argued that, since the purpose of organizations is to deliver impact (Emerson, 2003), the success and efficiency of an intervention should be assessed at the end of the logic model – impacts (Ebrahim and Rangan, 2014). However, impacts in terms of social change can mean very long term effects and because of the casual relationship between outcome and impact, outcomes can be “proxies for impact” (Twersky et al., 2010: 14).

Figure 1. Logic Model of a social intervention



Source: Adapted from Mass (2014)

Outcome is the effect of the social intervention in the individuals of the target group, such as improving nutrition and health of homeless people (Rauscher et al. 2012; Ebrahim and Rangan, 2014). Some authors argue that assessing “outcomes” presents some limitations: outcomes are often not directly and uniquely caused by organizations’ actions (Ebrahim and Rangan, 2014) and they are in constant interaction with the social, cultural and economic context (Austin et al. 2006; Kroeger and Weber, 2014). In response to the previous criticism, Rauscher et al. (2012) propose to subtract the **deadweight** - “outcome that would have been produced even without intervention” – from the outcome being assessed, to obtain a proxy for its impact that can be used in social impact measurement (Rauscher et al. 2012: 6).

Social impact measurement, as social performance evaluation, is a crucial step in the process of delivering the maximum societal change (Kroeger and Weber, 2015; Kaplan, 2001). A standard and robust measurement methodology will help organizations to overcome some of the difficulties they find in the social field (see **Table 3**).

Table 3. Reasons to explain why measurement is needed in social sector

	Source	Explanation
<i>1 - Funding Gap</i>	Austin et al. (2012) Kaplan (2011) Epstein and Yuthas (2014)	Lack of sufficient resources to solve infinite social needs originates an intensive competition among interventions and organizations
<i>2 – Framework for comparing interventions</i>	Veldman (2009) Kroeger and Weber (2015) Dees (2012)	Comparison among social interventions should be established in order to choose the one that delivers more efficiently and less costly the largest impact
<i>3 – Knowledge sharing</i>	Twersky et al. (2010) Veldman (2009) Kramer (2005)	Diffusion of results, goals and collaborations will be beneficial for all the community; sharing the reasons of failure or success will improve future interventions
<i>4 – Accountability and transparency</i>	Kramer (2005) Kroeger and Weber (2014)	A standard performance measure would promote transparency, communication and a less uncertain funding framework and funders may be less reluctant to invest in social interventions

Social organizations perceive measurement as expensive, ambiguous and difficult to be applied (Epstein and Yuthas, 2014, Veldman, 2011). In order to simplify, **traditional financial metrics** are, in some cases, adopted. They are useful in the sense that they allow an objective evaluation of managers’ performance and the financial sustainability of a social project (Kramer, 2005), but they do not assess accurately all the dimensions of the success of a non-profit organization, many of which are non-financial dimensions (Kaplan, 2001). Despite the urgent need for a multidimensional measurement system (Kaplan, 2001), the academic work on social performance measurement is still weak (Kroeger and Weber, 2015; Ebrahim and Rangan, 2014) and the current expertise in this subject is mostly extracted from practice (Ebrahim and Rangan,

2014). The examples presented in literature are still embryonic (Kramer, 2005) and there are many obstacles that have to be overcome (Please see **Table 4**).

Table 4. Challenges in social performance measurement

	Source	Explanation
<i>Opportunity Cost</i>	Veldman (2009) Epstein and Yuthas (2012)	Trade-off between investing resources in evaluating operations or creating and improving social transformations
<i>Intangible dimension</i>	Kaplan (2001) Fujiwara and Campbell (2011)	Services and goods delivered by organizations are intangible (non-market goods) hence it is difficult to quantify them
<i>Subjectivity</i>	Veldman (2009) Kramer (2005) Retoloza et al (2016)	Quantifying social impacts is a subjective process since it is composed by the perspectives of all the stakeholders involved that have different interests
<i>Time Lag</i>	Ebrahim and Rangan (2014) Veldman (2009) Twersky et al. (2010)	There is a significant time separation between the moment of action/investment and the materialization of the desired impact.

5. Economic Evaluation in Social Impact Measurement

Within the field of social impact measurement, some methods are known as **economic evaluation** – they evaluate if an intervention or project is economically efficient by identifying, measuring and comparing the cost and consequences of resource allocation against alternative uses (Rauscher et al. 2012). Economic evaluation can be grouped into four different types: cost analysis, cost-effectiveness (CEA), cost-utility and cost-benefit (CBA), depending on the identification and measurement of effects (Please see **Appendix 1**).

In the social field, since there is no standard evaluation approach (Veldman, 2011), philanthropic and non-profit organizations have developed their own measurement frameworks (Kramer, 2005; Tuan, 2008), based on the assumptions of CEA and CBA (Maas, 2014; Veldman, 2011) (Please find examples in **Appendix 2**).

For the purpose of this study, the analysis will be focused on CEA and CBA since they are the “classical economic approaches” that incorporate the cost in measuring social impact (Tuan,

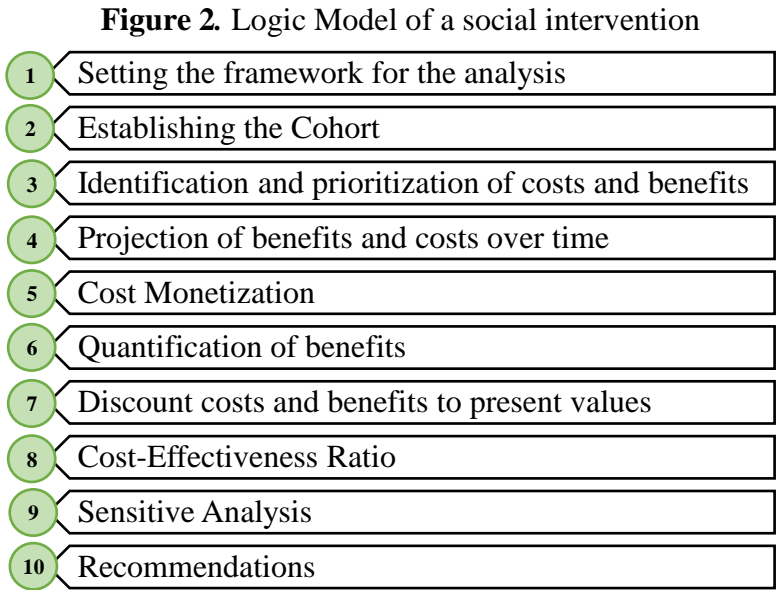
2008). CBA and CEA are related analytic methodologies that support organizations, authorities and other economic agents in their decision-making, by integrating economic-social costs and consequences/benefits (Yates, 2015; Udvarhelyi et al. 1992).

CBA is an economic evaluation that sets a monetary value to all costs and benefits of each social intervention (Cellin and Kee, 2015; Yates, 2015). The distinctive feature of CBA is the integration of outcomes measured in monetary units (Tuan, 2008) so that costs incurred are weighted against the monetized benefits (Cellin and Kee, 2015). For instance, when evaluating the construction of a bridge, a monetary value is placed on benefits – easier communication or reduction in car traffic - and on costs – environmental impact or financial building costs. Interventions are ranked as cost-beneficial (Yates, 2015) and chosen accordingly to their net benefits to society (Tuan, 2008).

CEA is a cost inclusive tool used to compare two or more interventions (Ashdown and Hummel-Rossi, 2002), usually, within the same area of impact (Tuan, 2008). Like CBA, CEA identifies and places a monetary value on costs, but those costs are related only with the key outcome (Cellin and Kee, 2015; Udvarhelyi et al. 1992). Since benefits are not measured in monetary units, intervention's costs are expressed per unit change in the specific outcome (Tuan, 2008; Rauscher et al. 2012). As an example, if we consider a drug rehabilitation program, some of the costs considered are wages paid to doctors and nurses, monetary cost of treatment drugs and opportunity cost of time. In CEA, those costs are expressed in terms of days without drugs (the key outcome of the intervention).

Despite their shared background, CEA and CBA differ on their information requirements: CBA is more arduous and complex (Tuan, 2008) because its purpose is to compare the monetary value (dollars or euros) of all costs and benefits of each intervention. While CEA just relates implementation's costs to the key outcome/impact obtained (Cellini and Kee, 2015). The

performances of CEA and CBA are demanding processes that include several steps (Cellin and Kee, 2015). Despite the purpose of an objective and quantified final result, the two analysis require subjective and hard decisions, regarding assumptions, estimations and other qualitative elements (Yates, 2015; Edejer et al. 2003). A simplification and summary of the processes of performing CEA and CBA (Cellin and Kee 2015), is presented in **Figure 2**. The process is common for the first steps, but it diverges from the sixth step – quantification of benefits



Source: Adapted from Cellin and Kee (2015)

1. Setting the framework for the analysis

Before starting the analytical process itself, it is indispensable to decide which analysis better fits the intention of the organization or individual (Cellin and Kee, 2015). First, the user should define and describe the *status quo* – “the state of the world in the absence of the program or policy (Cellin and Kee, 2015: 495) – that will be used as the **baseline** scenario to isolate the impact/outcomes of the intervention (Veldman, 2011; Tuan, 2008; Cellin and Kee, 2015). The status quo of a vaccination program could be the regular activity of health centers and hospitals and the medical services supplied before the vaccination program.

Two aspects have to be considered in choosing the more suitable framework: (1) the purpose – what will be measured (Maas, 2014) and how data will be evaluated (Tuan, 2008) – and, (2) the timing of analysis - prospective, ongoing or retrospective (Cellin and Kee, 2015; Maas, 2014). Both analysis can be applied before, after or during the program (Cellini and Kee, 2015; Yates, 2015). CEA estimates the costs per effectiveness unit (Rauscher et al. 2012) and consequently its practice is constrained to one impact domain (Tuan, 2008). CEA is most appropriate when the main outcome is intangible or difficult to be monetized (Cellin and Kee, 2015). The CBA framework should be chosen if the user aims to evaluate the net benefit to society of a single or multiple interventions (Tuan, 2008; Cellin and Kee, 2015) and, particularly, if the focus of analysis is the investors’ social and financial objectives (Maas, 2014). CEA and CBA are applicable to communicate to external stakeholders, for academic purposes and organization knowledge (Maas, 2014; Tuan, 2008)

2. Establishing the cohort

The second step refers to the definition of the relevant **stakeholders** for the analysis (Cellin and Kee, 2015). Stakeholders are the “individuals and groups that can affect or be affected by the activities and outcomes” (Epstein and Yuthas, 2014: 110). It is important to delineate who assumes the costs and who will benefit from the intervention and specify which stakeholders compose the target (Cox et al. 2008; Deloitte, 2016; Cellin and Kee, 2015). In order to define the cohort, objective criteria can be considered, such as “age, sex, race, geographical location, or health status, size and distribution of the target cohort” (Deloitte, 2016: 15). It is argued that the geographical area criterion could be the basis for setting the scope of CEA and CBA - “The analyst should base her definition of society on the jurisdiction that will bear the brunt of the costs and receive the majority of the benefits” (Cellin and Kee, 2015: 498).

3. *Identification and prioritization of costs and benefits*

After establishing the cohort of the analysis, benefits and costs should be identified and classified (Udvarhelyi et al. 1992; Tuan, 2008; Cellin and Kee, 2015). In what concerns the definition of cost and benefit, some authors argue that, in the context of social impact measurement, **cost** comprises the financial resources and the negative impacts created by the intervention while **benefits** are the positive impacts (Cellin and Kee, 2015). In opposition, Yates (2015) and Rausher et al. (2012) define **costs** as the monetary value of the resources invested in the intervention and **benefits** as the positive or negative outcomes achieved. Every social program or policy is affected and affects a broad variety of individuals, hence it is difficult to identify and classify each benefit and cost (Cellin and Kee, 2015). The user should try to understand the most relevant benefits and costs. The participation of stakeholders may simplify this process and add value to the social performance evaluation (Cox et al. 2008; Cellin and Kee, 2015; Veldman, 2011; Ashdown and Hummel-Rossi, 2002).

4. *Projection of costs and benefits over time*

CEA and CBA have to consider the timeline of the project being evaluated and specify the timing of costs and benefits (Cellin and Kee, 2015; Tuan, 2008). In social interventions, it is usual that the desired impact takes many years or decades to be observed (Twersky et al. 2010), complicating the definition of the time frame (Cellin and Kee, 2015; Veldman, 2011). The choice between long and short term will depend on the useful life of each social intervention (Veldman, 2011; Cellin and Kee, 2015) and, in some cases, both perspectives are required (Maas, 2014). Traditionally, CBA and CEA are performed for a time horizon of five to fifty years (Cellin and Kee, 2015). Having a defined timeline, costs and benefits have to be identified for each year of the program (Cellin and Kee, 2015). Since CEA and CBA can be implemented before, during and after the intervention (Yates, 2015), the analysis can be *ex ante* – costs and outcomes are predicted – or *ex post* – actual costs and benefits are used (Cellin and Kee, 2015).

5. Cost Monetization

The CEA and CBA seek to place a monetary value on each cost and costs are said to be monetized (Cellin and Kee, 2015; Udvarhelyi et al. 1992). **Monetization** measures “social and environmental indicators and translate[s] those indicators [benefits and costs] into a monetary value comparable with traditional financial data” (Maas, 2014: 11). Monetary unit (dollar or euro) is accept as the standard measure because it facilitates comparison and addition, and is commonly understood by people (Cellin and Kee, 2015).

The previous categorization of costs, depending on their nature, (described in step 4) and the definition of the agents responsible for the costs incurred (described in step 2) are now useful to find the best metrics to be used in the cost monetization process (Cellin and Kee, 2015; Deloitte, 2016). Financial reports and budgets provide data concerning the resources invested: workers’ salaries, capital costs, services, material and other costs. However, those may not be the most accurate and complete sources of information (Cellin and Kee, 2015; Yates, 2015; Ashdown and Hummel-Rossi, 2002). As an example , one of the most valuable resources of social sector organizations is the time devoted by volunteers (Yates, 2015) but this cost is not reflected in financial information (Yates, 2015; Ashdown and Hummel-Rossi, 2002). In order to overcome the obstacles in the process of cost monetization, Cellin and Kee (2015), suggest to analyze separately the costs with respect to the different stakeholders groups.

6. Quantification of benefits

The method followed to quantify benefits is what distinguish CEA and CBA (Robinson, 1993): for CBA, consequences (or effects) are measured in monetary unit (benefits are monetized) while, in CEA, benefits are estimated in **natural non-monetary units** – units of effectiveness that correspond to the “quantifiable outcome central to the program’s objective” (Cellin and Kee, 2015: 494), for example “life year saved” (Tuan, 2008: 31).

In CEA, costs of social interventions are related to a key outcome so the outcome used as reference has to be a reliable measure of program's success and should be related with its objective (Cellin and Kee, 2015). In addition, since the purpose of CEA is to compare two or more interventions, the user should opt for a natural unit common to different programs (Ashdown and Hummel-Rossi, 2002). For example, if the social intervention is about heart medicines, the absence of cardiac events can be the natural unit chosen but the life expectancy is a better unit, since it is applicable to other health interventions. Benefits are, then, quantified in natural units (Tuan, 2008), but only the outcomes caused by the program should be taken into account (Cellin and Kee, 2015). This is possible by assessing the actual scenario with intervention against the baseline state (defined in step 1) (Veldman, 2011; Tuan, 2008; Cellin and Kee, 2015).

In CBA, the ideal objective is to place a monetary value for every relevant benefit (Cellin and Kee, 2015; Tuan, 2008). Some benefits can be easily monetized following the same methods applied to cost, but others, in particularly *nonmarket benefits*, are difficult to be converted into monetary units (Yates, 2015; Cellin and Kee, 2015; Cox et al. 2012). **Non-market good** is “any good or service which is not traded in markets, such as public goods, but also elements of and events in one's life such as health, employment and marriage” (Fujiwara and Campbell, 2011: 9). The absence of a readily market price reflecting the value for society (Veldman, 2011) is overcome by the estimation of **shadow prices** – monetary value that is attached to each social intervention's outcome ((Tuan, 2008; Cellin and Kee, 2015; Veldman, 2011; Tuan, 2008). Four main approaches are suggested by the literature to obtain shadow prices of non-market benefits. A summary can be found that in **table 5**. Each valuation method for non-market benefits has disadvantages and advantages. Choosing the most appropriate and accurate approach depends on the intervention's features and domain (Fujiwara and Campbell, 2011).

Table 5. Valuation techniques for nonmarket benefits

	Human Capital	Stated Preferences (Willingness to pay)	Revealed Preferences	Life Satisfaction approach
Definition	The benefit is measured in terms of present value of the future flow of income earned by an individual	Beneficiaries are asked to state their preferences among different alternatives in monetary terms, how much they are willing to pay for receipt that benefit	Benefits are measured based on the observation of people’s behavior toward risky situations	Value of benefits is estimated by evaluating their impact on people’s well-being, life satisfaction or happiness
Criticism	Ethical issues, labor market imperfections absence of individual person’s valuation	Strong assumption of rational individuals; dependence on individuals’ income	Restrict application, market imperfections	Relatively new approach

Source: Based on Robinson (1993), Fujiwara and Campbell (2011) and Frey et al. (2004)

Nevertheless, willingness-to-pay has been the preference on the context of CBA (Yates, 2015) while life satisfaction approach, because of its early development, has been treated as a complement to the traditional preference-based approaches (Fujiwara and Campbell, 2011).

7. Discount costs and benefits to obtain present values

Having costs and benefits quantified, CBA and CEA have to discount all monetary values to their present value (Cellin and Kee, 2015; Tuan, 2008). By investing resources on a specific program, the organization or individual is deciding not to allocate those resources to alternative programs, thus there is an opportunity cost to be considered (Cellin and Kee, 2015). Moreover, people value more benefits today than benefits tomorrow (Veldman, 2011; Yates, 2015). These situations are considered, by adjusting costs and benefits through the **social discount rate** - “is meant to reflect society’s impatience or preference for consumption today over consumption in the future” (Cellin and Kee, 2015: 518). There is no consensus regarding the social discount rate (Veldman, 2011) and Cellin and Kee (2015) suggest using a real discount rate of 2 to 3%

and later testing the hypothesis of higher social discount rates (described in step 9). The mathematical formulas for the calculation of the present values are presented in **Appendix 3**.

8. *Compute a cost-effectiveness ratio for CEA or net present value for CBA*

The formulas for computing the outputs of CEA and CBA, adapted from Cellin and Kee (2015) are presented in **Appendix 4**.

CEA: In this step, it is calculated the **cost-effectiveness ratio** (Cellin and Kee, 2015; Tuan, 2008) that expresses, for each intervention, the trade-off between costs incurred, in monetary units, and the outcomes achieved (Ashdown and Hummel-Rossi, 2002). Examples of cost-effectiveness ratios are “cost per person cured of malaria, cost per child educated for one additional year, cost per automobile accident avoided” (Tuan, 2008:28).

CBA: There are three outputs from CBA (Tuan, 2008). The key metric is the **Net Present Value** (NPV) that assesses the net benefits; **Benefit-cost ratio** and **Internal rate of return** (IRR) are applied as complement to NPV (Tuan, 2008; Cellin and Kee, 2015). The benefit cost ratio is more appropriate for comparing similar projects while the IRR corresponds to the social discount rate such that the present value of benefits matches the present value of costs (Cellin and Kee, 2015).

9. *Sensitive Analysis*

After computing the CEA and CBA outputs, sensitivity analysis should be performed with the aim of testing if the results obtained are robust and accurate, by modifying some or all assumptions taken in the process (Udvarhelyi et al. 1992). Both CEA and CBA require lots of data and the user almost never have access to perfect information (Cox et al. 2012). Thus, the user has to judge and decide many aspects, such as the approach for evaluating non-market benefits or the social interest rate to be applied. The sensitivity analysis can be partial (varying

only one assumption at a time) or extreme (testing all the assumption under the best or worst case scenario) (Cellin and Kee, 2015).

10. Recommendations

To conclude CEA and CBA, a recommendation should be made based on the computed metrics, described in step 8 (Cellin and Kee, 2015). The estimation of the cost-effectiveness ratio of a single program reveals little information, unless it is compared with other programs (Yates, 2015; Tuan, 2008). Hence, when comparing alternative programs to achieve a desired outcome, the user should implement the more efficient alternative – the program with lower cost-effectiveness ratio (Cellin and Kee, 2015; Edejer et al. 2003). The decision based on CBA is more straightforward: the intervention is realized if the NPV is positive and is rejected for a negative NPV (Cellin and Kee, 2015). However, in none of the cases, recommendations or decisions should be founded solely on the estimations obtained (Yates, 2015; Ashdown and Hummel-Rossi, 2002).

6. Health Care Analysis

Malnutrition, infant mortality, mental health, drug addiction or even excess of unnecessary health care are examples of social problems in the health care system. They affect negatively and largely society. The costs and consequences of these social problems can take the form of lower quality of life, monetary costs (to health system or tax payers), familiar problems or increased poverty, among others. Social entrepreneurs, by developing innovative and lasting solutions, have an important role on solving social problems. Take the example of *Medic Mobile*, a social enterprise that intends to improve health care in countries in Africa, Latin America and Asia, making medical assistance easier and quicker. The idea is that mobile phones can be used to register, track and communicate patients and diseases efficiently, in remote and poor areas.

In health care, similarly to what happens in other social fields, efficacy is no longer a sufficient condition to implement a health care policy or intervention (Udvarhelyi et al. 1992), as the high costs and the increasing demand for health care require economic evaluation (Higgins and Harris, 2012). Indeed, CEA and CBA can facilitate medical and policy decisions by promoting the most efficient health care practices (Udvarhelyi et al. 1992; Yin and Forman, 1995). Being financially responsible for how each Euro is spent (Ashown and Hummel-Rossi, 2002) is increasingly important, specially, for a country as Portugal that is still recovering from a severe economic crisis.

The adoption of CEA or CBA, in the health economic literature, as the best analytic methodology is object of an active debate. Strengths and weakness are presented in **Table 6**.

Table 6. Strengths and weakness of Cost-Benefit and Cost-Effectiveness Analysis

	Cost-Benefit Analysis	Cost-Effectiveness Analysis
Strengths	<ul style="list-style-type: none"> - Comparison across health and non-health sectors - Addition of different benefits - Objective measurement unit 	<ul style="list-style-type: none"> - Easier comprehension - Easier execution - Starting point - QALY - important health outcome
Weakness	<ul style="list-style-type: none"> - Robust Assumptions - Costly and complex process - Monetization limitations 	<ul style="list-style-type: none"> - Context-specific - Costly process - Ambiguous results - Subjective measurement unit

Source: Based on Edejer et al. (2003), Cellin and Kee (2015), Robinson (1993) and Yin and Forman (1995)

CEA and CBA, applied to health care systems, weigh rationally costs and benefits caused by new policies, technologies or procedures (Yin and Forman, 1995). The use of CBA in health care evaluations implies the problematic and sometimes unethical task of placing a monetary value on health or human life (Robinson, 1993). While on the one hand a standard and universal unit as Euro or Dollar enables comparisons across health systems and non-health sectors (Robinson, 1993; Yin and Forman, 1995), on the other hand, health outcomes are so complex

and subjective that measuring them in terms of a single and decontextualized monetary unit can be very limited (Higgins and Harris, 2012; Robinson, 1993). None of the valuation techniques for nonmarket benefits (previously presented in **table 5**) can be straightforwardly apply to health outcomes. For example, if people are asked to state how much are they willing to pay for a health care service, as a X-ray exam, their answers will probably diverge. First, they do not have the necessary information or training to value the benefit. Secondly, the value placed will depend on each person: a perfectly healthy individual may set a lower value than the one set by a person that has or had in the past some health condition.

Because of its wider domain of appliance, CBA is assumed as the “ideal analysis”, but the requirement of unrealistic assumptions, as the patient having perfect information about his health conditions, and the subjective and controversial monetization process make CBA to be criticized in favor of CEA. One particular type of CEA that suits the economic health care evaluation is the **Cost-Utility Analysis** (CUA). In CUA, monetary costs are related to outcomes expressed in terms of utility, being utility “the amount of ‘satisfaction’ yielded from the health care program” (Yin and Forman, 1995: 312). Examples of utility measures are **QALYs** – quality adjusted life years – and **DALYs** – disability adjusted life year (Yates, 2015) (Please see **Appendix 5** for more details). In some sense, CUA acts as a compromise choice between CEA and CBA: a utility measure as QALY is a non-monetary and easier applicable metric, circumventing the problem of benefit monetization in CBA, and it is also a general accept unit in the health sector, mitigating the problem of comparison prevailing in CEA. The number of CEA (and CUA) has presented a significant growth and QALY has become the “cornerstone” of economic health analysis (Whitehead and Ali, 2010). Assessing health benefits in terms of QALYs takes into consideration not only the number of lives saved or life expectancy, but also the quality of those lives - years gained (Higgins and Harris, 2012; Yin and Forman, 1995). For a diabetic patient, a healthy lifestyle and taking medicines is preferable to the future risk of

amputation in even if his life expectancy is the same in both situations, because his quality of life in the remaining years is probably better.

In the context of health care interventions, CEA is the most used economic evaluation, since it offers to policy-makers, doctors, patients and health care providers an effective and useful tool to assess the value of health interventions. In Portuguese literature, there is a significant number of CEA and CUA (see Table 9 for some examples).

Table 7. Strengths and weakness of Cost-Benefit and Cost-Effectiveness Analysis

Authors	Clinical Area	Effectiveness Unit
Munguambe et al. (2014)	Ischaemic heart disease	Absence of cardiac events, number of prevented interventions, number of cardiac catheterization prevented
Lourenço et al. (2012)	Venous thromboembolism	QALYs
Matos (2012)	Pressure Ulcers (prevention)	Percentage of prevented pressure ulcers and recovery of pre-existent pressure ulcers
Araújo et al. (2007)	Lung Cancer	Years of life and QALYs

7. Conclusions and main recommendations

The larger project *One.Cost* aims to centralize information and build a database of the unit costs of social problems affecting Portugal. The contribution of the present Work Project is to define and understand concepts related with the process of assessing social problems and to identify and critically analyze economic methodologies to estimate the costs of social health problems.

Measuring economically the social impact created by interventions, programs and policies is a complex and arduous process. In health care, there are many factors that make social impact measurement difficult and costly. CEA and CBA require many resources (time, money, knowledge) and the excessive application of economic analysis for each and every health care interventions would be inefficient and irrational. Estimating the benefits and the costs of health

interventions may implies ethical and equity issues, since the current valuation techniques are controversial and cause, in some cases social inequalities. Moreover, it is required expertise and access to health system databases to better understand the health social problems, the medical procedures involved and accurately estimate their costs and benefits. In the context of health care in Portugal, the main limitation of the application of CEA or CBA is the lack of an organized and accessible information database. The available information on the cost of health care interventions is often dispersed, incomplete and difficult to analyze.

The finding of this papers suggest that for the purpose of the *One.Cost* project, CEA is the most appropriate economic evaluation and a valuable starting point, since it intends to find answers for questions as *How much does it cost per year a cancer patient?* Further research projects should attempt to estimate the social cost of a specific social problem in the health area, by applying the cost-effectiveness framework, presented in this paper. Interviewing Portuguese experts and contacting health care institutions and organizations may help to overcome some of the challenges aforementioned.

8. References

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